

Michael J. Dzara

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Education

Colorado School of Mines

Ph. D. in Materials Science
Advisor: Prof. Svitlana Pylypenko
GPA: 3.43/4.00

Expected May, 2019

Rochester Institute of Technology (RIT)

B.S. in Chemical Engineering
GPA: 3.78/4.00

May, 2015

Research Experience

Doctoral Research

Colorado School of Mines/National Renewable Energy Laboratory
Non-Precious Metal Catalyst Materials

August 2015 to Present

Advisor: Prof. Svitlana Pylypenko
Surfaces of Applied Materials Group
Department of Chemistry

- Synthesized and characterized iron and nitrogen doped carbon spheres as a model catalyst; performed advanced characterization studies including ambient pressure x-ray photoelectron and absorption spectroscopies at the Advanced Light Source synchrotron facility
- Performed electrochemical characterization of perovskite oxide/carbon composites, and analyzed perovskite oxides by x-ray photoelectron spectroscopy
- Characterized a series of iron and nitrogen containing carbon catalysts by scanning transmission electron microscopy and energy dispersive x-ray spectroscopy, yielding valuable information correlating performance trends with physical properties
- Yielded 3 presentations at national and international conferences, co-authorship of 3 peer-reviewed publications, and a book chapter

Science Undergraduate Laboratory Internship (2)

National Renewable Energy Laboratory
Solar Fuel Materials Research

June 2015 to August 2015

Advisor: Dr. K. Xerxes Steirer
Surface Analysis Group
Materials Science Division

- Carried out photoelectrochemical (PEC) measurements of p-GaAs films to evaluate their stability with simulated PEC device operation
- Assisted in X-ray photoelectron spectroscopy analysis of p-GaAs films to determine changes in surface chemistry after simulated PEC device operation
- Conducted photocurrent onset measurements on dipole modified p-GaAs samples

Science Undergraduate Laboratory Internship (1)

June 2014 to August 2014

National Renewable Energy Laboratory

Synthesis of Thin Films for Photovoltaics Research

Advisor: Dr. K. Xerxes Steirer

Surface Analysis Group

Materials Science Division

- Synthesized ZnOS thin films on Mo substrates through chemical bath deposition in an inert atmosphere glove-box
- Characterized ZnOS thin films thickness through profilometry, and opto-electronic properties through UV-Vis reflectance measurements
- Completed a literature survey of reported bandgap values for ZnS thin films prepared by chemical bath deposition and how they varied with bath parameters
- Used the above survey to aid in the interpretation of ZnOS bandgap measurements, and how they compared to reported values

Higher Education Research Experience

January 2014 to April 2014

Oak Ridge National Laboratory

Polymer Nanocomposite Research

Advisor: Dr. M. Parans Paranthaman

Materials Chemistry Group

Chemical Sciences Division

- Synthesized Polyimide (PI) polymer nanocomposite films incorporating *in situ* synthesized ceramic nanoparticles through a sol-gel process for radiation resistant electrical insulation materials
- Characterized mechanical properties of nano-metal oxide PI films through dynamic mechanical analysis
- Optimized the thermal processing of pure PI films and evaluated the impact of thermal processing on reaction completion through C13 NMR
- Evaluated the change in mechanical properties of pure PI films as the PI reaction went to completion through manipulation of the thermal processing of PI films

Undergraduate Research

May 2012 to May 2015

Rochester Institute of Technology

Lithium Ion Battery Research

Advisors: Dr. Michael Forney and Prof. Brian Landi

Department of Chemical Engineering

NanoPower Research Laboratory

- Designed and conducted experiments studying novel anodes for lithium ion batteries that comprise germanium nanoparticles (Ge-NP) and single wall carbon nanotubes (SWCNT)
- Fabrication of Ge-NP:SWCNT electrodes through slurry casting and fabrication of coin cells for testing
- Evaluation of electrochemical performance of Ge-NP:SWCNT electrodes in coin cells with respect to cycling rate and cycling life
- Characterized electrode materials and Ge-NP:SWCNT electrodes through scanning electron microscopy and Raman spectroscopy
- Purification and purity assessment of SWCNT
- Contributed to monthly progress reports for the research sponsor

Teaching Experience

K-8 STEM Education Fellow

August 2016 to Present

Colorado School of Mines

Grade levels: K-5

Advisor: Prof. Barbara Moskal

- Taught at and organized two weeklong STEM camps for 4th-7th grade students
- Designed and taught 45-minute STEM lesson plans for kindergartners twice a week with the goal of introducing the scientific method and the fundamentals of problem solving
- Assisted in running a 1.5-hour after school STEM club for 3rd-5th graders
- Taught 2-hour chemistry lesson/lab to 8th graders as part of STEM-focused field trips to Colorado School of Mines
- Organized and participated in a “Science Night” for K-2nd graders in which 10-15 STEM demonstrations and activities were setup for students to participate in
- Participated in and helped organize the judging of science fair projects

Teaching Assistant

January 2015 to May 2015

Rochester Institute of Technology

Course: Mass Transfer Operations

Professor: Dr. Reginald Rogers

Department of Chemical Engineering

- Graded homework assignments and assisted with grading exams
- Tutored students during office hours and individual appointments

Course: Multi-scale Material Science

August 2014 to December 2014

Professor: Dr. Brian Landi

Department of Chemical Engineering

- Updated and created homework assignments and exam problems

- Graded homework assignments and assisted with grading exams
- Tutored students during office hours and individual appointments

Technical Skills

Lab Techniques: Synthesis of Fe-N-C catalyst materials via wet impregnation, catalyst ink preparation, ion implantation, preparation of lithium ion battery electrodes, coin cell assembly in an inert glove-box, battery testing using an Arbin BT 2000 battery cycler, single wall carbon nanotube purification, sol-gel synthesis of polymer-ceramic nanocomposites, chemical bath deposition of ZnOS thin films in an inert glove-box

Characterization: X-ray photoelectron spectroscopy, electrochemical testing, thermogravimetric analysis, UV-Vis spectroscopy, Raman spectroscopy, scanning electron microscopy, dynamic mechanical analysis, stylus profilometry

Computer skills: Microsoft Office, Igor Pro, Casa XPS, Kaleidagraph, ImageJ, Matlab, Minitab

Peer-reviewed Journal Articles

1. “Platinum group metal-free electrocatalysts: Effects of synthesis on structure and performance in proton-exchange membrane fuel cell cathodes” Michael J. Workman, **Michael Dzara**, Chilan Ngo, Svitlana Pylypenko, Alexey Serov, Sam McKinney, Jonathan Gordon, Plamen Atanassov, and Kateryna Artyushkova. *J. Power Sources*, 2017, **348**, 30-39. <http://dx.doi.org/10.1016/j.jpowsour.2017.02.067>
2. “Core Level Shifts of Hydrogenated Pyridinic and Pyrrolic Nitrogen in the Nitrogen-Containing Graphene-Based Electrocatalysts: In-Plane vs Edge Defects” Ivana Matanovic, Kateryna Artyushkova, Matthew B. Strand, **Michael J. Dzara**, Svitlana Pylypenko, and Plamen Atanassov. *J. Phys. Chem. C*, 2016, **120**, 29225–29232. <http://dx.doi.org/10.1021/acs.jpcc.6b09778>
3. “Direct Conversion of Hydride to Siloxane Terminated Silicon Quantum Dots” Ryan T. Anderson, Xiaoning Zang, Roshan Fernando, **Michael J. Dzara**, Chilan Ngo, Meredith Sharps, Rebecca Pinals, Svitlana Pylypenko, Mark T. Lusk, and Alan Sellinger. *J. Phys. Chem. C*, 2016, **120**, 25822-25831. <http://dx.doi.org/10.1021/acs.jpcc.6b07930>
4. “Remarkable stability of unmodified GaAs photocathodes during hydrogen evolution in acidic electrolyte” James L. Young, K. Xerxes Steirer, **Michael J. Dzara**, John A. Turner, and Todd G. Deutsch. *J. Mater. Chem. A*, 2016, **4** (8), 2831-2836. <http://dx.doi.org/10.1039/C5TA07648J>
5. “Co-solvent Enhanced Zinc Oxysulfide Buffer Layers in Kesterite Copper Zinc Tin Selenide Solar Cells” K. Xerxes Steirer, Rebekah L. Garris, Jian V. Li, **Michael J. Dzara**, Paul F. Ndione, Kannan Ramanathan, Ingrid Repins, Glenn Teeter, and Craig L. Perkins. *Phys. Chem. Chem. Phys.*, 2015, **17**, 15355-15364. <http://dx.doi.org/10.1039/C5CP01607J>

6. “Advanced Germanium Nanoparticle Composite Anodes using Single Wall Carbon Nanotube Conductive Additives” Michael W. Forney, **Michael J. Dzara**, Amanda L. Doucett, Matthew J. Ganter, Jason W. Staub, Richard D. Ridgley, and Brian J. Landi. *J. Mater. Chem. A*, 2014, **2**, 14528-14535. <http://dx.doi.org/10.1039/C4TA02011A>

Peer-reviewed Book Chapter

1. Chilan Ngo, **Michael J. Dzara**, Sarah Shulda, and Svitlana Pylypenko, Spectroscopy and Microscopy for Characterization of Fuel Cell Catalysts. In *Electrocatalysts for Low Temperature Fuel Cells – Fundamentals and Recent Trends*. 1st Edition. T. Maiyalagan, V. S. Saji, Eds.; Wiley-VCH Verlag GmbH & Co. KGaA. July 2017, In Print.

Presentations

Oral Presentations:

1. **Michael J. Dzara**, Chilan Ngo, Michael Workman, Plamen Atanassov, Kateryna Artyushkova, Svitlana Pylypenko “Elucidating performance-property in Pt-group metal free oxygen reduction reaction catalysts” *25th Meeting of the North American Catalysis Society*, June 5th 2017.
2. **Michael J. Dzara**, Prabhuram Joghee, Jason Christ, Chilan Ngo, Christopher Cadigan, Tim Batson, Ryan Richards, Ryan O’Hayre, Svitlana Pylypenko “Optimization of Perovskite Oxide/Carbon Composites for Oxygen Reduction Reaction in Alkaline Media” *230th Meeting of The Electrochemical Society, ECS PRiME*, October 4th 2016.
3. **Michael J. Dzara**, Dylan Boucher, Eric Greve, Tolga Aytug, Parans Paranthaman “Radiation resistant electrical insulation materials using ceramic nanoparticle polymer films” *Oak Ridge National Laboratory Undergraduate Mid-term Symposium*, March 13th 2014.
4. **Michael J. Dzara**, Michael W. Forney, Brian J. Landi “Rate Performance of Germanium Nanoparticle SWCNT Composite Anodes as a Function of SWCNT Loading and Areal Capacity” *Rochester Institute of Technology Undergraduate Research Symposium*, August 2nd 2013.

Poster Presentations:

1. **Michael J. Dzara**, Chilan Ngo, Jason Christ, Prabhuram Joghee, Christopher Cadigan, Tim Batson, Ryan Richards, Ryan O’Hayre, Svitlana Pylypenko “Optimizing the Surface of Perovskite Oxide/Carbon Composites as Catalysts for the Oxygen Reduction Reaction in Alkaline Media” *63rd International Meeting of the American Vacuum Society*, November 8th 2016.
2. **Michael J. Dzara**, Chilan Ngo, Michael Workman, Plamen Atanassov, Kateryna Artyushkova, Svitlana Pylypenko “Advanced Microscopy of Non-Precious Metal Catalysts for Structure-Property-Performance Correlations” *230th Meeting of The Electrochemical Society, ECS PRiME*, October 5th 2016.

3. **Michael J. Dzara**, James Young, and K. Xerxes Steirer “Evaluating the durability of p-GaAs films in solar water splitting applications” *National Renewable Energy Laboratory SULI Summer Poster Session*, August 5th 2015.
4. **Michael J. Dzara**, Michael W. Forney, A. L. Doucett, M. J. Ganter, J. W. Staub, R. D. Ridgley, and B. J. Landi “Advanced Germanium Nanoparticle Composite Anodes using Single Wall Carbon Nanotube Conductive Additives” *2014 AIChE Annual Student Conference Undergraduate Student Poster Competition*, November 17th 2014.
5. **Michael J. Dzara**, K. Xerxes Steirer “Effect of Dimethyl Sulfoxide on Zinc Oxysulfide Buffer Layers” *National Renewable Energy Laboratory SULI Summer Poster Session*, August 6th 2014.
6. **Michael J. Dzara**, Tolga Aytug, Amit Naskar, Robert Duckworth, Keith Leonard, G. Polyzos, and M. Parans Paranthaman “Radiation-resistant electrical insulation materials using ceramic nanoparticle polymer films” *Oak Ridge National Laboratory Spring Undergraduate Poster Session*, April 24th 2014.
7. **Michael J. Dzara**, Michael W. Forney, Brian J. Landi “Rate Performance of Germanium Nanoparticle SWCNT Composite Anodes as a Function of SWCNT Loading and Areal Capacity” *NY BEST Technology Conference*, September 25th 2013.

Awards/Honors

2017 Kokes Award for the 25th North American Catalysis Society Meeting *February, 2017*

NSF Graduate Research Fellowship Program Honorable Mention *April, 2016*

Poate First Year Doctoral Fellowship *April, 2015*

Merit based departmental funding for the first year of doctoral study

Invited Participant in RIT President’s Roundtable

Participated in Undergraduate Research Panel Discussion *April, 2015*

- Represented the Kate Gleason College of Engineering as an undergraduate researcher at the RIT President’s Roundtable
- Answered questions and participated in a panel discussion on the importance of undergraduate research
- Presented a poster (“Advanced Germanium Nanoparticle Composite Anodes using Single Wall Carbon Nanotube Conductive Additives”) highlighting my undergraduate research at RIT

Leadership

American Vacuum Society (AVS) - CSM student chapter

Founding Chair of CSM AVS Student Chapter

January 2016 to Present

- Organized and established the student chapter by collecting signatures, forming an executive board and general club membership, and drafting a constitution for the student chapter
- Led outreach events focused on introducing kids to scientific principles and experiments involving vacuum science and technology

American Institute of Chemical Engineers - RIT student chapter (AIChE)

Member of executive board as ChemE Car President

August 2014 to May 2015

- Participated in AIChE e-board meetings and aided in making decisions for the club
- Organized and led the ChemE car branch of AIChE, which worked on designing, building, and testing a shoe-box sized car that is both driven and stopped via chemical reaction(s)
- Appointed project leaders and a compliance officer and conducted leadership meetings to maintain the structure of the group and ensure the progress of the projects
- Conducted general meetings in order to instruct students in methods for design and necessary lab practices
- Lead the creation of an exhibit for the 2015 Imagine RIT Innovation Festival

Project Leader in ChemE Car

August 2013 to Dec. 2013

- Conducted design team meetings consisting of a group of 5-10 students working on car design
- Delegated certain design tasks to groups of 2 or 3 students in order to ensure productive meetings
- Led the selection of ideas through the use of Pugh Matrices to finalize a design
- Created and presented a design pitch at the conclusion of the semester